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POLLUTION OF NEW YORK HARBOR AS A MENACE TO HEALTH BY THE DISSEMINATION OF INTESTINAL DISEASES THROUGH THE AGENCY OF THE COMMON HOUSE FLY

A REPORT BY DANIEL D. JACKSON, S. B., TO THE COMMITTEE ON POLLUTION OF THE MERCHANTS' ASSOCIATION OF NEW YORK

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COMMITTEE ON

POLLUTION OF THE WATERS OF NEW YORK

EDWARD HATCH, JR., *Chairman*
J. PIERPONT MORGAN
ALBERT VANDER VEER, M. D.
JOHN Y. CULYER, C. E.
DANIEL D. JACKSON, S. B.

REPORT OF COMMITTEE ON POLLUTION OF WATERS OF NEW YORK.

To the Board of Directors of The Merchants' Association of New York:

GENTLEMEN:—

YOUR Committee on Pollution of State Waters, in its investigation of the general subject of pollution of public waters, has, during the past summer, caused to be made a careful study of the accumulation of human excreta and similar substances upon the City's water front, and the effect of such accumulations upon the public health.

This study, a report of which is submitted herewith, was under the immediate direction of Dr. Daniel D. Jackson, who was assisted by a number of observers. Examinations of the water front of Greater New York were made at frequent intervals during a considerable period of time to determine the existence, persistence and location of accumulations of excreta. It was found that such accumulations, of large extent, constantly existed under the piers, in slips, in back-waters and wherever impediments to the free flow of the tide caused the formation of eddies. They were most extensive and constant in the immediate neighborhood of the sewer outlets, which are the principal channel for the discharge of excreta into the waters of the harbor.

It is a well-established fact that the excreta of persons suffering from typhoid and various intestinal diseases are infested with the bacteria which are the cause of and which transmit such diseases. Such bacteria, propagated in excreta, may be diffused by various media. When they effect a lodgment in food intended for human consumption, those who consume such food may become infected with the disease.

Dr. Jackson's report demonstrates that the common fly is one of the most active agents in disseminating certain intestinal diseases.

Bacteriological studies were made of flies that had been feeding on human excreta and they were found to carry vast numbers of disease germs. It was further found that flies were most abundant where the accumulations of floating excreta were greatest, namely, near sewer outlets; and that cases of intestinal diseases were most numerous in the sections adjacent to such sewer outlets. It is clearly established by these studies that the excessive prevalence of certain diseases coincides with the presence of accumulations of infected human excreta and with the presence of aggregations of flies as the active agents for transmitting the disease germs derived from the excreta.

The several maps and diagrams accompanying Dr. Jackson's report exhibit the distribution of intestinal diseases upon the Island of Manhattan during the summer months, and their greater prevalence in the neighborhood of sewer outlets; and also the coincidence between the increase of such diseases and the prevalence of flies.

It has been contended by a certain school of sanitary science that the discharge of sewage into the tidal waters surrounding this city is at present only sentimentally objectionable, such sewage being rendered innocuous by the natural action of the moving waters by which it is received. Your Committee is of the opinion that Dr. Jackson's study demonstrates that the present method of discharging untreated sewage is one of

the principal causes in the dissemination of certain diseases; and that it affords a conclusive argument for restricting, and if possible, abolishing the practice of depositing disease-laden sewage in the nearest public waters.

Other work of your Committee, directed toward securing due enforcement of the laws for the protection of public waters against pollution, is summarized in the appended letter (Appendix B) addressed to the Governor of the State.

All of which is respectfully submitted.

EDWARD HATCH, JR., *Chairman.*
J. PIERPONT MORGAN.
JOHN Y. CULYER, C. E
ALBERT VANDER VEER, M. D.
DANIEL D. JACKSON, S. B.
Committee on Pollution of State Waters
The Merchants' Association of New York.

NEW YORK, Dec. 14, 1907.

POLLUTION OF NEW YORK HARBOR AS A MENACE TO HEALTH BY THE DISSEMINATION OF INTESTINAL DISEASES THROUGH THE AGENCY OF THE COMMON HOUSE FLY.

BY
DANIEL D. JACKSON, S. B.

POLLUTION OF NEW YORK HARBOR AS A MENACE TO HEALTH BY THE DISSEMINATION OF INTESTINAL DISEASES THROUGH THE AGENCY OF THE COMMON HOUSE FLY.

NEW YORK, December 2nd, 1907.

Mr. Edward Hatch, Jr.,
Chairman Committee on Pollution, The Merchants' Association of New York.

SIR:—

I SUBMIT herewith a report on the sanitary condition of the water front of Greater New York, together with studies as to the transmission of disease by flies due to the extremely unhealthful conditions found, in order to make a thorough investigation of the water front, regular inspectors were employed during the summer and the entire shore lines, together with the docks, have been examined. It was found that at many points sewer outfalls have not been carried below the low water mark, in consequence of which the solid matters from the sewers have been exposed on the shores. It was also found that during the summer months on and near the majority of the docks in the city, a large amount of human excreta was deposited. It was also shown from our studies that deposits of this nature may, through the agency of flies, become a source of typhoid fever and other intestinal diseases.

The large amount of work which has been carried on during the summer has been divided into two parts:—

FIRST.—A thorough inspection of all sources of contamination throughout the entire water front.

SECOND.—A study of the prevalence and distribution of flies by fly cages distributed in all parts of the city in order to demonstrate what proportion of the intestinal diseases in the city were contracted by means of these insects.

SANITARY INSPECTION OF THE WATER FRONT.

The following is a detailed account by Boroughs of the results of the various inspections:—

BOROUGH OF MANHATTAN.

Conditions Bad:—Excreta and Flies. North River Piers 1, 3, 6, 7, 8, 16 (P. R. R.), 14 (Red Star), 29 (P. R. R.), 30 (Hudson Day Line), 38 (Southern Pacific), 40 (New Bedford Line), 44 (Lehigh), 51 (Cunard), 60 (Dumping Pier).

East River Piers 9, 10, 16, 20, 29, 36 (old), 32, 33, 45 (old), (N. Y. C.), 49 (N. Y. C. N. H., & H. old), 38 (N. Y. N. H. & H.), 50 (old) (N. Y., N. H. & H.), 51 (old), 112th Street (Recreation), 151st Street (Harlem River)

Conditions Very Bad:—Large amount of excreta and flies. North River Piers 2, 11, 16 (N. Y. C.), 18 (Providence Line), 21 (Erie), 23 (N. Y. C. bad), 25 (Southern Pacific), 37

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(Southern Pacific), 42 (French Line), 45, 48 (White Star) ,49 (White Star), 50 (Wilson Line), 54 (Anchor Line), 55 (Hamburg-American, toilet filthy). 56 (Lehigh Valley), 58 (D. L. & W.), 59 (Bristol), Foot of 60th Street closet in filthy condition. 133d and 161st Streets, closets in bad condition.

East River. 4 (N. Y. C.), 21 (B. & O.), 91st Street, 3rd Avenue and 130th Street, Harlem River. 146th Street.

Special Conditions:—North River. Pier 33, Refuse and Dumping pier. Flies and horse manure. Human excreta under pier.

Pier 46, no toilet, deposits of excreta.

Pier 56½, Grace Street Public Dock. Wholesale Fish and Oysters; swarms of flies.

Pier 54, no toilet; human excreta and flies.

Between Piers 59 and 60, foot of 20th Street; sewage deposit and rank odor; sewer blocked up back of pier.

Near 61, accumulation of all kinds, dead dog and swarms of flies.

Pier 67, decayed fish and fruit in water covered with flies. (36th Street).

Pier 79, unloading horse manure. Swarms of flies.

Pier 80, near 40th Street; beef house. Millions of flies.

Between 81st and 82nd streets near 42nd Street ferry; refuse containing fecal matter washed ashore.

Pier 84, large amount of excreta on dock.

Foot of 47th Street; swarms of flies and refuse dumps.

Foot of 48th Street; dogs and cats washed ashore (flies in water on bloated dead animals).

Between 72nd and 97th Streets; many deposits of excreta from bathers.

Above 79th Street; some deposits of excreta from bathers.

90th Street; number of dead animals and swarms of flies.

Between 95th and 96th Streets; dumping pier. Swarms of flies.

97th to 129th Streets; swimming places and excreta.

134th Street; dumping pier and rags; refuse and flies.

Foot of 138th Street; near stone wall; regular open place where much human excreta is deposited.

Foot of 139th Street; deposits of excreta. Swimming place.

140 Street; sewage matter washed ashore; large deposits on shore. Swarms of flies.

142nd-147th Streets; swimming places; fecal deposits on shore.

155th Street bath; dead dog in water covered with flies.

North side of 155th Street; bath, public closet on shore, full of excreta exposed to flies.

Special Conditions: East River:—

Piers 1 and 2; ferry. Quantities of flies.

Pier 5; no toilet whatever on dock; sewage in water.

Pier 6; no toilet whatever on dock; sewage in water.

Pier 8; Cuyler's Alley, Spanish Line. Maggots in refuse along sides of pier inside. More or less sewage.

Pier 9, Munson Line, old slip; large number of flies and much refuse.

Pier 10, N.Y. & Baltimore Trans. Line; closet with a large amount of exposed excreta.

Pier 11; refuse about entrance.

Between 14th and 15th Streets; refuse from lunches, etc., flies and maggots.

Pier 16, Mallory Line; closet bad; much excreta.

Pier 17, Fulton Market; cracks and sides of pier covered with maggots, fishy odor; old fish about the entrance and around the market attract flies in large swarms. Crab and oyster cars in water.

Pier 18; large amount of horse manure on pier.

Pier 19, Bridgeport Line; floor covered with rubbish and horse manure, quantities of refuse along street, especially around the market. Several places where maggots were in evidence. Sewage in bulkhead.

Pier 20, Peck Slip; closet bad; sewage bad.

Pier 21, B.&O.R.R.; closet on a little extension on side. Excreta all retained on the flooring; very bad.

Pier 34; wooden bulkhead covered with sewage, maggots. Water filled with sewage.

Pier 36, Old Recreation Pier; human excreta along edges, behind boxes and cases, mostly from children. Bad odor from sewage.

Pier 45 (Old) N. Y., N. H., & H. R. R.; floor very dirty; rubbish, sewage.

Pier 57 (old); horse manure; water filled with garbage from dump on next pier; flies on garbage on dock, etc.

Pier 48 (old), garbage dock; water in neighborhood filled with floating garbage. Also unsanitary conditions on dock. Quantities of flies.

Pier 49 (old), N. Y., N. H. & H. R. R.; water polluted with sewage. Closet filthy.

Pier 38, N. Y., N. H., & H. R. R.; floor covered with horse droppings and dirt; water full of sewage; flies very thick at outer end of pier and bad odor present.

Pier 50 (old), N. Y., N. H. & H. R. R.; closet bad. At entrance and along street front, decayed vegetables; flies everywhere.

Pier 51 (old); same condition as 50 (old).

Pier 52 (old); bulkheads covered with filth and sewage; black with flies.

Pier 53 (old); outer corner used as closet; floor very dirty.

Pier 54 (old); water filled with sewage. Above pier collects on shore at low tide. Children bathe here. Sewage and flies.

Pier 55 (old), Grand Street, New York Fire Department; water filled with sewage.

Pier 50; ice and manure. Manure scattered about; also large amount around stables along shore. Flies. One side of pier used for loading manure; other side for unloading ice.

Pier 52, open; manure and ice dock. Manure scattered about.

Pier 56, 4th Street; human excreta around lumber piles on shore. Flies.

Pier 57, 5th Street; ice and manure. Pier clean except on outside edges where manure lodges. Same unloading feature as at Pier 50.

Pier 69 (old), 10th Street; horse droppings; human excreta in corners covered with flies.

Pier 70, 22nd Street, New England Line; horse droppings and flies; sewage.

Pier 76, 28th Street; sewage in street at entrance; garbage in water; a couple of dead cats were also seen.

Pier 77; garbage dump. Sanitary conditions very bad. Also large amount of paper and rags scattered about. Black with flies.

Pier 78, 30th Street; horse droppings swept into heaps and allowed to stand. Sewage in water.

Pier 80, 32nd Street; seldom swept. Horse droppings.

Pier 86, 36th Street; wood, sand and ice. Considerable rubbish about entrance.

[redacted]

Foot of 42nd Street; floating sewage abundant in water. Odor from United Dressed Beef Co. very evident. Flies abundant in ferry slip.

43rd Street; rubbish from United Dressed Beef Co. on side of street attracts flies in swarms, especially old barrels in which beef has been shipped. Maggots were present. Odor of sewage strong around L. I. R. R. Dock. Odor bad behind slaughter house. Plenty of sewage and excreta in water. Yards of slaughter house are filthy and kept very wet.

44th Street; dirty and in bad condition.

45th Street; slaughter house runs right over water. Beams underneath catch refuse which is prolific of flies. Filthy all along bulkheads. Liquid refuse runs into water beside dock and is not carried away by current.

46th Street; garbage dump and manure dock. Innumerable flies.

47th Street; water filled with manure. Street dirty from stable refuse.

48th Street; water full of refuse.

49th Street; very dirty around entrance to dock.

Between 49th and 50th Streets; sewage in water and excreta on rocky shore. Flies.

52nd Street; water contains much sewage.

53rd Street; water filthy. Excreta behind lumber piles.

55th Street; rubbish and garbage on rocks. Water full of sewage. Garbage is dumped on rocks at this point. Sewage washed up; food for flies.

56th Street; piles of manure at foot of street. Flies.

57th Street; sewage flows down banks to water; conditions very bad; flies.

59th Street; below the bridge small sewer empties on the rocks above high water and solid matter which accumulates covered with flies.

62nd Street; ice dock. Old excreta in corners and behind platforms propagating flies. Sewage under wharf on upper side; no current to carry it away.

63rd to 75th Streets; rocky shore; several places human excreta present. Sewage washed up and covered with flies.

78th Street; much sewage in water.

79th Street; water filthy.

81st Street; old rags scattered about on river front; placed there by pickers to dry. Flies prevalent.

83rd Street; high and rocky; sewage on shore.

84th Street; baths. Water filled with garbage and sewage.

86th Street; water filled with sewage.

89th Street; sewage on rocks, floated ashore; water very dirty.

Between 89th and 90th Streets; old wooden sewer pipes on shore containing rubbish and excreta. Flies.

90th Street; excreta under pier not washed away. Also small sewer empties on shore and refuse cannot be washed away. Flies.

91st Street; closet on dock empties behind bulkhead. Excreta behind lumber on wharf. Ice dock; very dirty.

92nd Street Ferry; water filled with sewage. Flies in ferryboat cabins. Old excreta and garbage on shore near brewery.

93rd Street; water contains much sewage. open closet on shore contains much excreta. Flies everywhere. Closet flushed out at high tide only.

94th Street; Ice and coal. Water contains sewage. Between 93rd and 94th Streets there is much excreta among lumber piles on shore.

95th Street; water filled with sewage and an oily substance. Conditions worse because barges prevent free access of the current.

96th Street; water covered with masses of floating sewage. Children bathing and waiting opportunity to dive into water as sewage passes by, coming to surface through mass of filth covering head and shoulders.

98th Street; water in slip very bad; shore littered with rags and rubbish. Poultry market. Flies.

99th Street; water contains sewage and held in by back eddy. Flies.

100th Street; water contains sewage; excreta in one of the outer corners of dock.

105th Street; manure wharf; very dirty; swarms of flies. Wooden bulkheads hold manure.

106th Street; much sewage in water; rubbish in street.

107th Street; garbage and rubbish on dock. Very bad below; swarms of flies. Sewer extremely bad at low tide.

108th Street; water filthy. Little current. Masses of sewage.

110th Street; dock covered with rubbish. Masses of sewage. Wooden bulkheads retain sewage. Flies.

112th Street, Recreation Pier; sewage in masses. Flies. Some closets not properly flushed.

114th Street; sewage ashore; swarms of flies. Street littered with garbage. Two dead cats in advanced stage of decomposition.

115th Street; sewage in water. Excreta on shore. Flies.

116th Street; water dirty and covered with oily scum. Large amount of escaping gas from water. Odor vile.

118th Street; sewage in water. Not much current to carry it away.

119th Street; much sewage in water. Sewage matter on shore at low tide.

120th Street; loose stone bulkhead retains sewage as also does piling at low tide.

121st Street; water filthy. Sewer broken and exposed at low tide and sewage deposited on shore covered with flies, also garbage on shore above high water.

122nd Street; sewer exposed at high water and excreta washes ashore at low tide Flies. Sewer is only an exposed wooden trough. Complaints from Police Station next door.

123rd Street; garbage dumped on shore above high water mark. Flies.

124th Street; sewer of wood and exposed at high water. Shore littered with excreta and numerous dead animals.

125th Street; water filled with sewage.

HARLEM RIVER.

1st Avenue; excreta in water. Large amount of excreta and rubbish under bridge approach and on wharf under bridge.

127th Street from 2nd Avenue to 1st Avenue, bridge; littered with rubbish. Street in bad condition. Decayed matter and swarms of flies.

128th Street; much sewage in water. Manure scattered about. Crates containing hen manure piled along street. Swarms of flies.

2nd Avenue; rubbish dump for elevated car sweepings.

3rd Avenue and 130th Street; bad condition under bridge and along shore. An open closet in lot west of bridge. General sanitary conditions very bad.

Park Avenue; bad conditions around bridge. Excreta on shore. Much sewage in water west of bridge.

Madison Avenue; excreta under bridge. Rags, etc., scattered around on west shore. Many flies.

140th Street and 9th Avenue; marsh being filled in. Contains sewage which can not get to river. Flies.

141st Street; sewage spreads out over low lands from a sewer some distance from shore. Flies and mosquitoes.

142nd Street; sewer exposed at low tide and held back on shore. Swarms of flies.

145th Street; sewage in water. Much manure west of bridge. Human excreta behind lumber piles.

146th Street; an old shanty with a filthy privy; stagnant water and garbage. Much excreta in water; countless mosquitoes and flies. Sewage flows over flats for 100 yards or so at low water.

147th Street and Lenox Avenue; sewer flow exposed at low tide and high. Excreta retained on wooden bulkheads near by on shore.

Shore by Subway yards at 147th and 148th Streets filthy from sewage.

150th Street; water filthy at low tide.

151st Street; sewer runs for 50 yards or so as a covered wooden trough. Covering not intact and of easy access for flies. Sewage collects on marsh land. Sanitary conditions bad around Atlanta Boat Club.

152nd Street; pools of stagnant water and sewage at low tide.

154th Street; human excreta along rear of fence on 7th Avenue. Bridge conditions bad.

157th Street; marsh with sewage on shore at low tide. Flies.

158th Street; water filthy. Closet on shore with exposed excreta. Rank conditions around bridge. Sewage on shore at low water. Flies.

BOROUGH OF BROOKLYN.

Toilets on docks not well kept. Foot of Fulton Street, 17, 28; foot of Hamilton Avenue, 34, 35; foot of Coffey Street, 46; Beard's Pier Erie Basin, Pier 5 Bush Stores; foot 52nd Street.

Conditions bad. Excreta and flies. Union Ferry Pier, foot of 22nd Street, Bath Beach.

Conditions very bad. Excreta and flies. Bulkhead near Pier 6, 11, 24, 30, 33, north of Pier 39.

Special Conditions. Above Brooklyn Bridge. Dock Street; excreta containing maggots. Wharf used for sugar. Attracts swarms of blow flies. Sweepings are collected outside and allowed to accumulate for some time before being carried away.

Washington Street; sewage fills up slip. New bridge pier prevents current from carrying it away. Flies.

Hudson Street; bad sewage conditions. Bad closet in coal yard.

Navy Yard; much sewage in water. Sewage matter adheres to piling all along north side. Flies.

Clinton Avenue; human excreta in places. Flies.

Washington Avenue; closet on P. R. R. pier at outer end bad.

Wallabout Place; water filthy and covered with an oily scum and sewage. Dredging frequent, sewage only being brought up.

Division Avenue; much sewage in water. Sewer being repaired. Flies.

South 9th Street; rubbish in street. Flies.

South 5th Street; sewer empties under pier and sewage collects all about on shore and piling. Very bad sanitary conditions. Flies.

South 4th Street; much sewage in water and on piling.

North 11th Street; water oily.

10th-11th Streets; Oil Company; sewage; oil in water.

North 12th Street; water filled with sewage and covered with oil.

Quay Street; open cut in street containing water and some sewage full of mosquito larvae.

Milton Street; littered with rubbish. Excreta around lumber piles. Flies.

Kent Street; excreta behind piles. Flies.

Java Street; excreta behind piles. Flies.

India Street; water filled with sewage.

Huron Street; sewage adheres to piling. Flies.

Freeman Street; water filthy with sewage.

Dupont Street to Vernon Avenue Bridge; water filthy with sewage.

Below Brooklyn Bridge:

Pier 8; heap horse manure and flies propagating.

Pier 15; horse manure and sweepings. Flies.

New York Dock Company controls piers from Brooklyn Bridge to Erie Basin. Very few toilets and the workmen have spoken about it but get no results.

On bulkhead below Pier 17 and below Pier 18 numerous deposits excreta and flies.

On bulkhead below Pier 19 toilet for whole yard deposits on shore and open to swarms of flies.

Pier 22, foot of Pacific; three dead calves full of maggots, killed because they had some disease. Flies in enormous number. Pier in filthy condition.

Bulkhead between 26 and 27; heaps of horse manure and flies very numerous. Same on Pier 27.

Bulkhead below Pier 32; refuse and several deposits of excreta. Same at foot of Hamilton Avenue.

Dead dog covered with flies floating in water between Piers 33 and 34.

Near Pier 38 on Dock; considerable deposit of human excreta and flies very numerous.

Foot of Dykman Street; deposits of excreta and all along shore thousands of flies. Toilet filthy.

Pier 46; deposits of excreta along bulkhead.

Foot of Hicks and foot of Henry Streets; deposits of excreta along shore. (Swimming place).

Dock Yard, between Clinton and Court; deposit from privy on shore and flies very numerous. Same foot of Smith Street.

Foot of 19th Street; dead pig in water; swelled up and covered with flies.

Along dock between 21st and 22nd Streets and on piles 22, numerous deposits of excreta and flies very numerous. Same foot of 34th Street.

Pier foot of 39th Street; large heap horse manure, numerous flies on it.

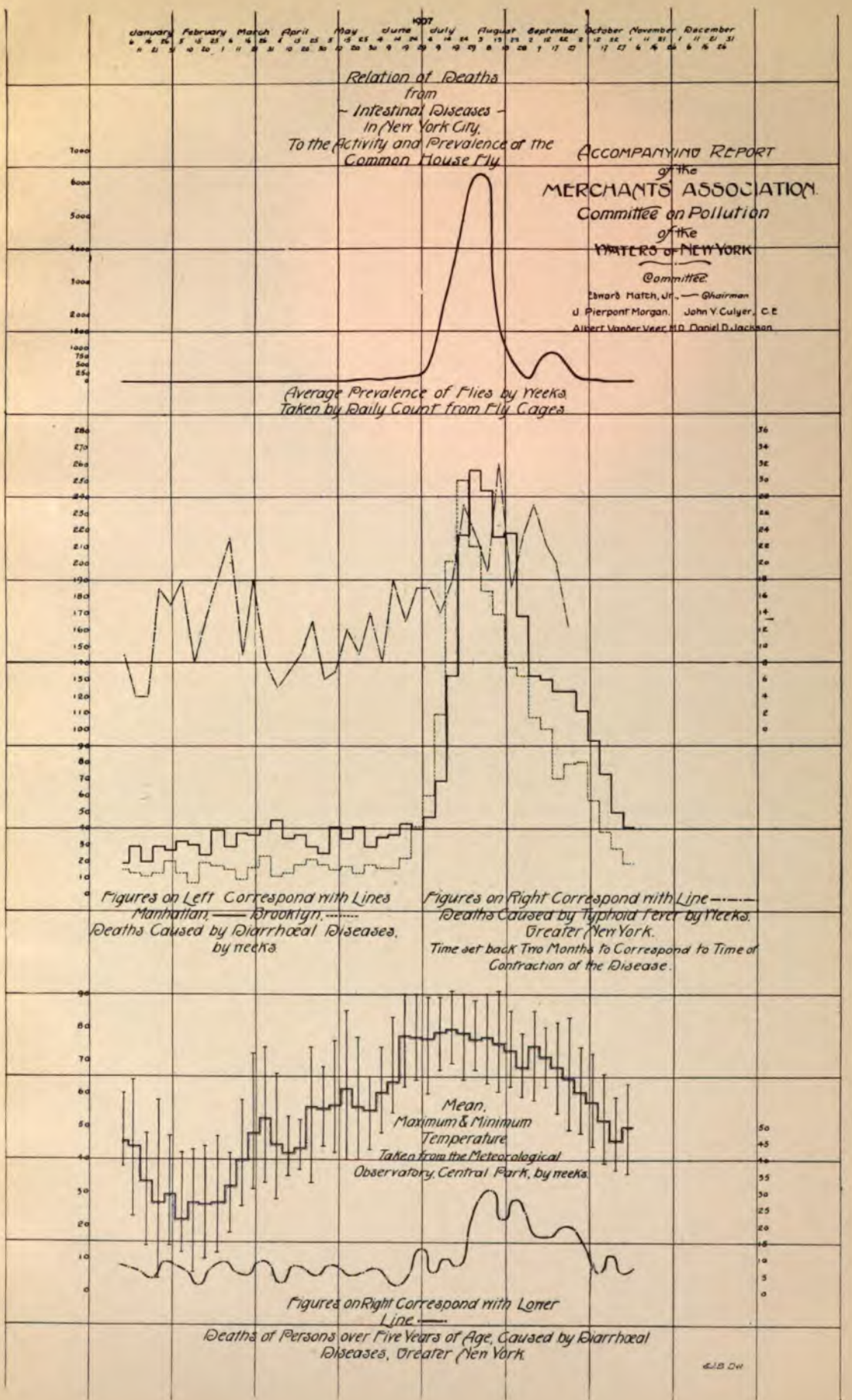
Pier 2, Bush Stores; same. Pier 6; same.

Foot of 54th Street; fecal deposits from swimmers. Flies.

Foot of 69th Street; fecal deposits from swimmers and also on shore north of it

Between 69th and 72nd Streets; dead animal covered with flies in water.

In Gravesend Bay and along the Coney Island Water front considerable garbage.


1907
January February March April May June July August September October November December
Relation of Deaths from Intestinal Diseases in New York City, To the Activity and Prevalence of the Common House Fly
Accompanying Report of the Merchants Association Committee on Pollution of the Waters of New York
Committee
Edward Match, Jr. — Chairman
J. Pierpont Morgan. John Y. Culyer, C.E.
Albert Vander Veer M.D. Daniel D. Jackson
Average Prevalence of Flies by Weeks Taken by Daily Count from Fly Cages
Figures on Left Correspond with Lines Manhattan, —— Brooklyn, ------ Deaths Caused by Diarrhoeal Diseases, by weeks
Figures on Right Correspond with Line —·—·— Deaths Caused by Typhoid Fever by Weeks, Greater New York. Time set back Two Months to Correspond to Time of Contraction of the Disease.
Mean, Maximum & Minimum Temperature Taken from the Meteorological Observatory, Central Park, by weeks
Figures on Right Correspond with Lower Line ——
Deaths of Persons over Five Years of Age, Caused by Diarrhoeal Diseases, Greater New York.

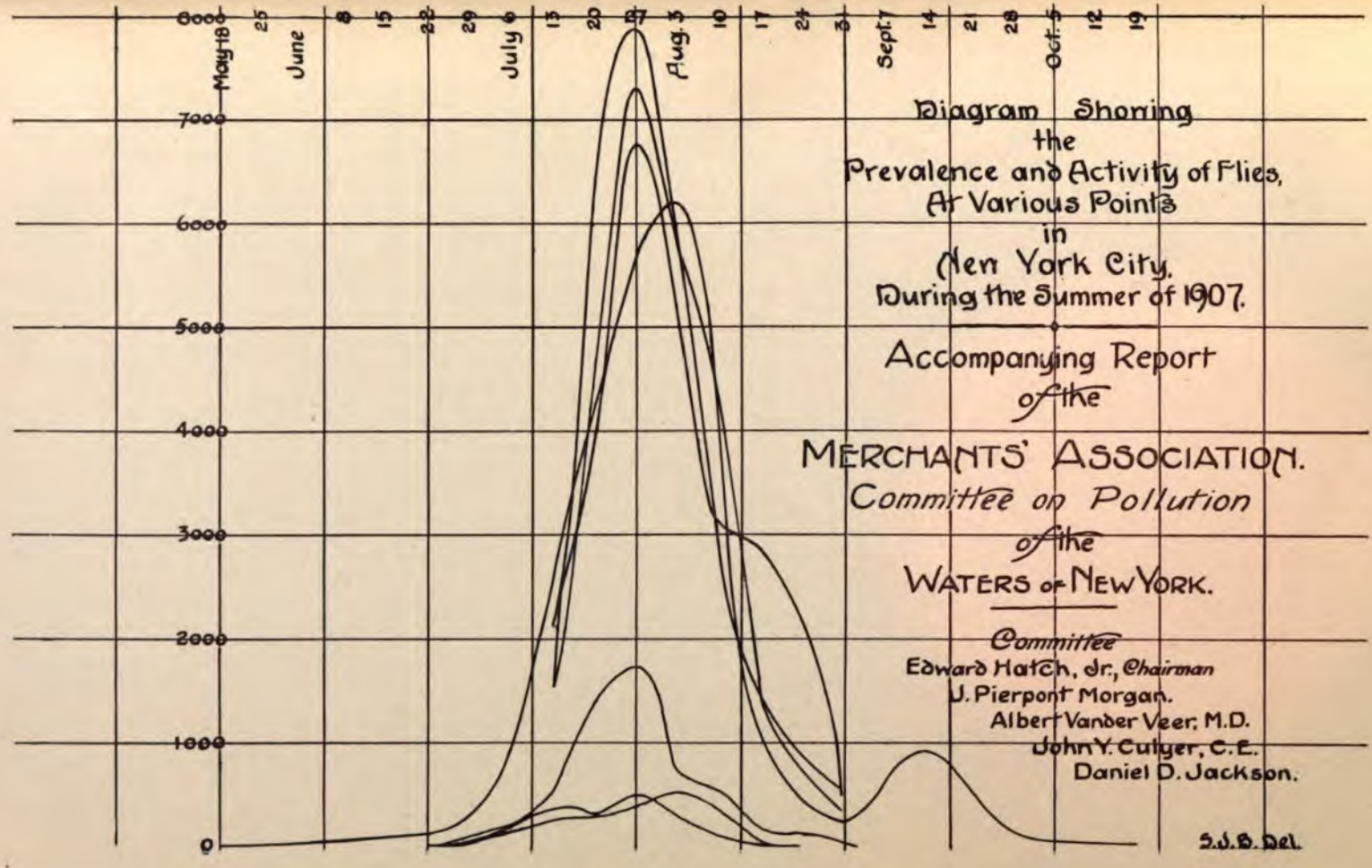


Diagram Showing the Prevalence and Activity of Flies, At Various Points in New York City, During the Summer of 1907.

Accompanying Report of the

MERCHANTS' ASSOCIATION.

Committee on Pollution of the

WATERS of NEW YORK.

Committee

Edward Hatch, Jr., Chairman
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nd some solid sewage matter washes ashore. At Coney Island offensive garbage in gutters. Swarms of flies.

In Jamaica Bay at Fresh Creek is a fishing village where sanitary conditions are very bad. At Golden City Park is a closet in bad condition and under the railway are numerous deposits of human excreta. South of this, garbage and rubbish are dumped about indiscriminately.

QUEENS.

North Shore. Newtown Creek. The water in this creek seems to be almost a thick black oil and is completely coated with an oily scum. Odor bad. At the upper end, the land is marshy and unimproved and breeds swarms of mosquitoes. Innumerable flies. West of Calvary Bridge where offal was loaded for shipment.

Near Maspeth Avenue Bridge a large concern prepares sausage casings. Odor rank. Flies.

Above Newtown Creek North. Pearsons & Son Towel Company near Long Island Tunnel; toilet filthy and excrement exposed to flies. L. I. R. R., yard, solid matter from sewer being washed ashore. Deposits on shore covered with flies. Between 6th and 7th Streets; toilets; excreta and flies.

Foot of 8th Street; sewer exposed, excreta being washed ashore attracts swarms of flies.

North side of 7th Street below West Avenue; negro house, brick building, two stories, second from corner. Fecal deposits very numerous in yard and vacant lot next to it. No toilet there.

Foot of Nott Avenue; sewer exposed, sewage being washed ashore. Flies.

Foot of Hamilton Street; toilet with entire deposit ashore at low tide.

Vernon Avenue and Broadway; sewage ashore and covered with flies.

Boulevard and Temple Street; sewer exposed at low tide and sewage being washed ashore. Covered with flies.

South Shore, Rockaway Beach; Hammels, rank sewer conditions. Sewage from sewers floats back on beach along shore and is covered with flies. Closet foot of Bay View Avenue in vile condition and deposits on shore. Below and west of Bay View Avenue, more deposits of fecal matter on shore.

Seaside: Wash and garbage on shore near Dock Hotel. Main sewers all exposed at low tide and deposits scattered in rows all along beach near outlets. Covered with flies. Clam digging at this point. Board of Health has signs prohibiting it but no notice is taken of the order. Also a large amount of house sewage deposits above low water and washes back on shore. Three privies with exposed fecal matter and numerous flies.

RICHMOND.

North Shore. St. George. Closet on R. R. Pier, large amount of excreta and many flies. Excreta supposed to go into water but most of it caught all along the slanting sides

New Brighton Station. Toilet with considerable excreta. Conditions bad. Flies.

Foot of Jersey Street; closet in unsanitary condition. Flies.

Just below Jersey Street; closet in bad condition.

Below Franklin Avenue, on shore to Sailors' Snug Harbor; sewage all exposed at low tide and some exposed all the time; sewage being washed ashore and many flies present.

Livingston Station; sewage being washed ashore on beach covered with flies. Same conditions east of ship yard.

West New Brighton; fourteen (14) exposed closets with swarms of flies near or on shore. Tide does not reach them.

Port Richmond; north and South of the pier sewage being washed ashore. Flies.

Mariners' Harbor; north and south of Linseed Oil Works sewage from sewers being washed ashore. Covered with flies.

Foot of Houseman Ave; same bad conditions and flies.

Foot of Union Avenue; exposed sewer runs about 200 feet before emptying into Kill Von Kull.

East Shore, St. George; below ferry landing toilet on dock, excreta and flies.

American Stores; two toilets, with exposed excreta and flies.

Below American Stores; large sewer and sewage washed ashore. Flies and many fecal deposits on shore.

North of lumber district; sewage being washed ashore. Covered with flies.

Stapleton, foot of Wave Street; numerous deposits on shore from bathers foot of Prospect Street, Toilet with entire deposit above high tide. Flies. (Near Barber Asphalt Co. plant).

Foot Canal Street; enclosed basin with large amount of sewage flowing into it. Vile conditions.

Chapman Wrecking Company; toilet with exposed excreta and flies.

North of Fort Wadsworth: Between Pennsylvania Avenue and Quarantine two sewers emptying above high water mark and deposits of excreta near the outfalls, covered with flies.

From the foregoing description, it is evident that there is ample opportunity for the transmission of typhoid and other intestinal diseases through the agency of flies. It has been shown that practically no proper toilets are to be found on or near the docks. The natural consequences of this condition of affairs have been pointed out. Deposits of human excreta, many of which contain disease, are distributed everywhere along the docks and water front. During the summer these deposits have been found to be covered with swarms of the common house fly.

Very bad sewer conditions have also been described. Broken sewers have been found and those which have outfalls, not only above the low water mark, but in some cases much above high water mark. Deposits from these along the shore in crevices and on the piles of the docks have been shown to be covered with flies.

It now remains to be proven to what extent these flies are contaminated with disease and how much disease in the city they actually transmit.

TRANSMISSION OF DISEASE BY FLIES.

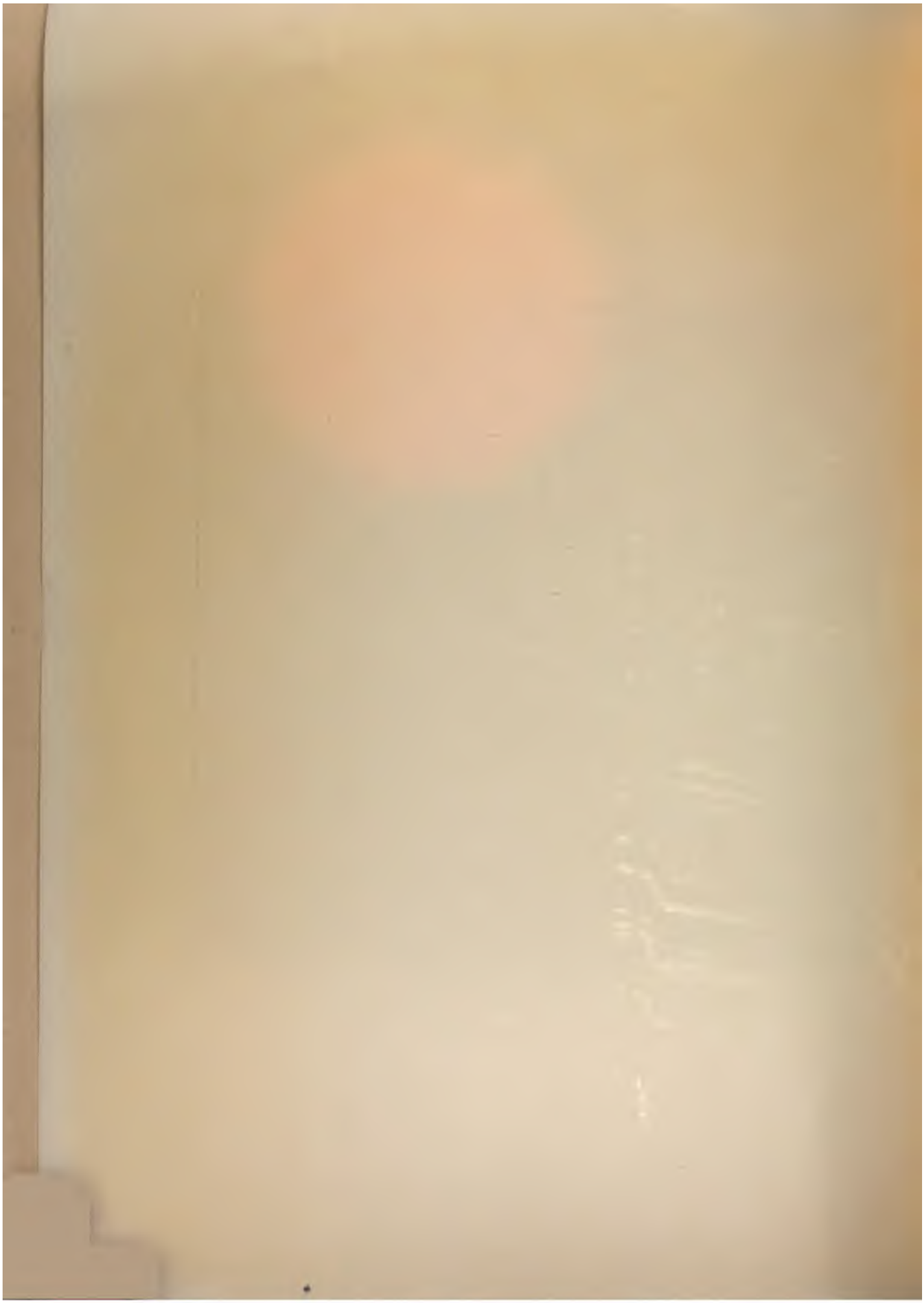
Examinations which were made of flies at the beginning of the season directly after hibernation showed that many of them carried only a few bacteria and molds and little or no fecal matter. Like examinations made later in the year showed the presence of numerous animal and vegetable parasites, fecal matter in abundance, large numbers and many kinds of germs, and in some cases individual flies carried as high as 100,000 fecal bacteria on their legs, mouth and body Over ninety-eight per cent. of the flies found in dwelling houses belong to one species known as the common house fly (Musca domestica).

Their activity extends over a very few weeks of the summer, after which most of them are frozen or killed by molds and other parasites. The few which hibernate and come out in the spring are noticeable in numbers in this climate about the middle of June.

These flies soon begin to lay eggs, preferably in horse manure, but they also lay in human excreta and in decaying animal and vegetable matter. These eggs are long and white and hatch in from six to eight hours.

BACTERIA LEFT BY FLY PASSING OVER GELATINE PLATE.

(Permission of Doubleday, Page & Co.)



The larvae, which are white, pointed maggots, grow rapidly, cast their skins twice, and under favorable conditions reach full growth in four or five days. The outer skin then becomes hard, swells up, turns dark brown in color, and within it the true pupa is formed. In about five days the adult fly issues forth from a round hole in the anterior end of the brown covering.

The total time required for a single generation is about ten days and the number of generations are said by some authorities to be as high as twelve during the summer. In New York City the actual number of generations is probably about one-half the number given, judging from the time of first appearance to the time of the culminating point or points of greatest prevalent numbers as shown on the diagram given later.

The number of eggs laid by each female fly during the season is about 1,000. Considering this and the number of generations each summer the enormous numbers in which the insect occurs is well accounted for.

In order to determine the time of greatest prevalence of flies in New York City, a large number of cages were placed in various parts of the city extending from City Island to Coney Island, and the flies caught each day were counted. These figures are collected into weekly totals in order to avoid the effect of weather on individual days. In many parts of the city, especially at a distance from the water front, or at points where no fecal matter was exposed, very few flies were found. Near the points indicated as unsanitary, as given in the description of the inspections, many flies were found. The following table gives seven points of the city which may be taken as representative:—

TABLE SHOWING TOTAL DEATHS BY WEEKS FROM DIARRHŒAL DISEASES COMPARED WITH THE GENERAL PREVALENCE OF FLIES IN NEW YORK CITY.

Flies caught in cages during the week.

Week Ending	Deaths from Diarrhoeal Diseases.	Brooklyn Stations.				Manhattan & Bronx Stations.		
		No. 1	No. 2.	No. 3.	No. 4.	West 33rd St.	East 42nd St.	City Island.
May 4	53	0	0	0	0	....	....	....
" 11	63	0	0	0	0	....	....	....
" 18	57	1	0	0	1	....	....	....
" 21	64	3	1	0	0	....	....	....
June 1	55	2	1	0	1	....	....	....
" 8	58	8	2	3	1	....	....	....
" 15	55	34	7	7	2	....	....	....
" 22	70	75	36	10	6	....	....	....
" 29	86	244	103	22	25	....	....	....
July 6	124	921	189	78	91	....	....	....
" 13	219	2,696	343	222	498	2,110	1,584	1,736
" 20	386	4,165	302	250	1,366	3,930	6,603	4,649
" 27	566	5,727	449	276	1,757	6,833	7,920	7,333
Aug. 3	576	6,224	277	284	663	5,180	5,757	3,685
" 10	517	3,926	52	71	499	3,136	4,249	3,089
" 17	478	1,165	11	19	142	2,964	1,364	1,464
" 24	422	435	6	11	120	2,267	779	835
" 31	346	99	4	22	32	423	352	570
Sept. 7	277	584	....	....	....	....	....	....
" 14	262	884	....	....	....	....	....	....
" 21	247	592	....	....	....	....	....	....
" 28	232	182	....	....	....	....	....	....
Oct. 5	213	52	....	....	....	....	....	....
" 12	168	47	....	....	....	....	....	....
" 19	128	51	....	....	....	....	....	....
" 26	91	32	....	....	....	....	....	....
Nov. 2	70	22	....	....	....	....	....	....
" 9	53	7	....	....	....	....	....	....
" 16	57	0	....	....	....	....	....	....

It will be seen from the above table that the time of appreciable prevalence of flies during 1907 was the three months beginning the first of July and ending the first of October. By far the greatest number occurred in the weeks ending July 27th and August 3rd. It will also be seen that the deaths from intestinal diseases rose above the normal at the same time at which the flies became prevalent; culminated at the same high point; and fell off with slight lag at the time of the gradual falling off of the prevalence of the insects.

In order that these facts may be brought out still more strongly a diagram is presented herewith, showing the relation of deaths from intestinal diseases in New York City to the activity and prevalence of the common house fly. This diagram shows the total deaths from intestinal diseases by weeks in Manhattan and Brooklyn, together with the deaths of intestinal diseases of adults and also the deaths from typhoid fever set back two months to correspond to the time at which the disease was contracted.

It will be seen that these curves correspond exactly with the temperature curves and with the curves of the activity and prevalence of flies. Even the secondary rise of flies in September is reflected in the rise of deaths from intestinal diseases.

This chart for 1907 demonstrates the relationship between the activity of flies and the deaths from typhoid fever and other intestinal diseases. But in order that there shall be no doubt left in the minds of those who may be skeptical on this point, a further demonstration of this matter is given herewith in the form of a diagram extending over the five previous years and showing each year the almost precise correspondence between the temperature curve which indicates the activity of flies and the curves of the typhoid fever and other intestinal diseases. In each year it will be noted that the secondary rise appears at about September 20th in the deaths of intestinal diseases of adults and some five days earlier in children. This corresponds to the secondary rise in the prevalence of flies, just as is shown in the diagram for 1907.

A still further corroboration of these facts is brought out by the accompanying map, which gives the plots of each individual case of typhoid fever on Manhattan Island contracted in a representative year in the city during the fly period. The map shows that practically all of the cases are within a few blocks of the water front and are thickest near the points described by our inspection as the most unsanitary districts.

We are spending considerable time and money in a war on mosquitoes. The cases of malaria reported in Greater New York in 1905 were but 359 and the deaths only 52.

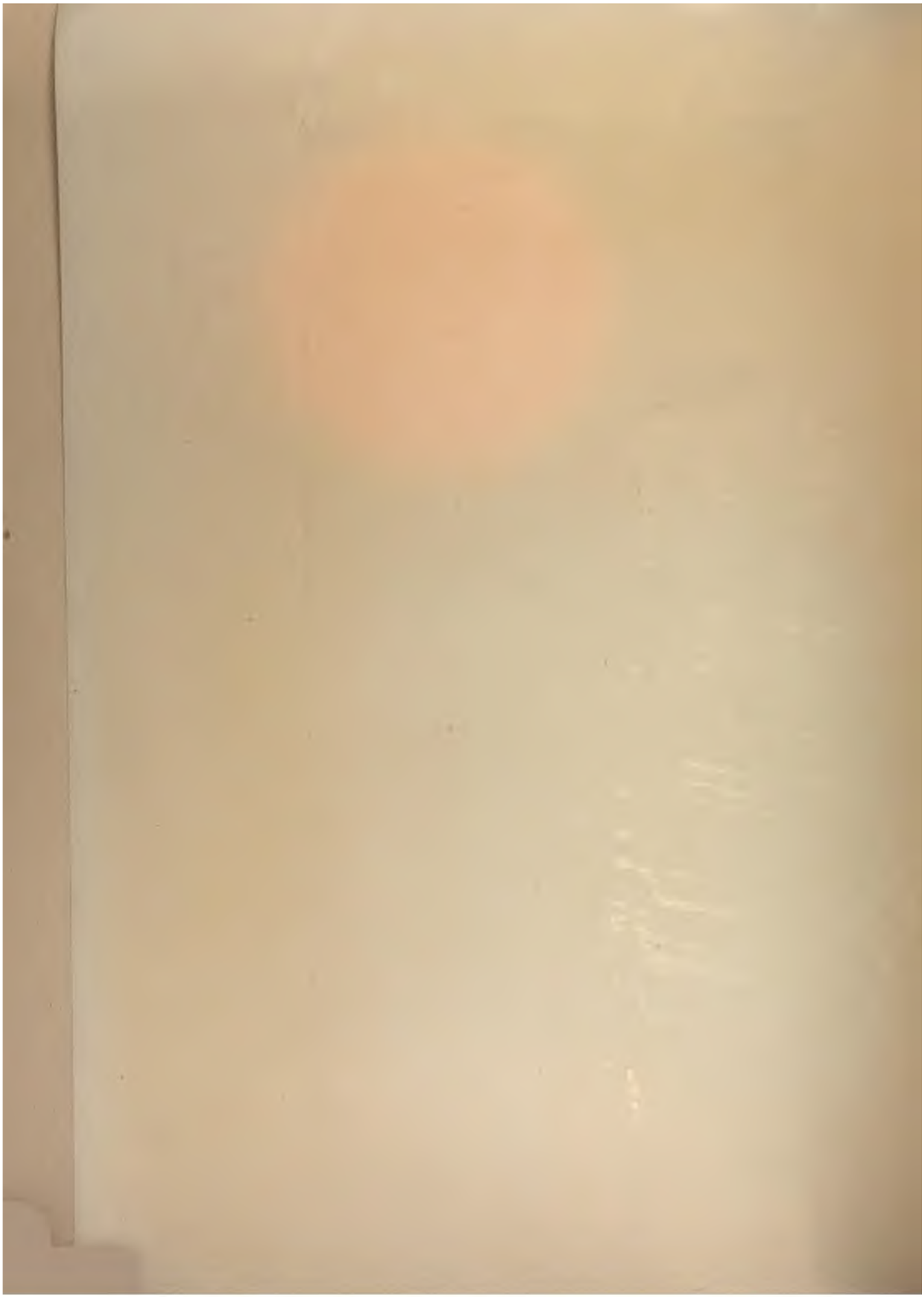
Much more to be feared is the common house fly. This so called harmless insect is one of the chief sources of infection, which in New York City causes annually about 650 deaths from typhoid fever and about 7,000 deaths yearly from other intestinal diseases. We are in the habit of considering the Fall rise in typhoid deaths as inevitable. The Fall rise, if set back two months from the report of deaths to the time of the contraction of the disease, will exactly correspond to the curve of prevalence of flies and to the curve of rise in deaths from intestinal diseases of both children and adults. It also corresponds to the temperature curve. We are therefore erroneously inclined to view the disease as due to hot weather. While climatic conditions, by reducing the vitality, favor the contraction of the disease, they are not the real cause of it. Temperature does not produce the specific germ which invariably accompanies the disease. The activity of the house fly is in proportion to the temperature; and the time at which it is most active and most numerous corresponds exactly with the time of the contraction of typhoid fever and other intestinal diseases.

Both in this country and abroad the prevalence of infantile diarrhœa is noted

FLY ON PIECE OF SPONGE CAKE.

(Permission of Doubleday, Page & Co.)

FLY'S FOOT ENLARGED.



during the period of hot weather. Epidemic dysentery, sporadic dysentery and diarrhœa of all kinds, except those induced by mechanical causes, are due to the presence of a specific germ.

The immunity from diarrhœa of breast-fed babies and the frequency of occurrence among artificially fed babies point strongly to the food as a medium of transmission. Much of this actual infection is undoubtedly due to flies.

Practically all the deaths were near the water front and are most numerous where sewage conditions are at their worst. An apparent exception to this rule occurs on the west side of the Bowery, as shown on accompanying map but an investigation of this locality disclosed the fact that many exposed open hopper toilets in a filthy condition, clogged with excreta and swarming with flies, were to be found in the yards.

A map has also been prepared showing the location of each individual death from intestinal diseases during the fly season. See map No. 2. This map shows even more conclusively the relation which these diseases bear to the unsanitary conditions along the water front and the heavily polluted waters of the rivers through the transmisson of disease germs by flies.

Several epidemics of dysentery of a malignant type have been known to radiate from a single point and to entirely disappear when proper disinfection of closets was enforced. On several occasions the author has traced local epidemics of typhoid fever to transmission by flies, and by staining fluids demonstrated the transit of the flies from the latrine to the kitchen. Ordinarily flies travel only a few rods from their breeding places, but when the days are warm and sultry they are stimulated to extra exertion. They extend their travels in the daytime and flock indoors at night.

They are attracted equally by food and filth and this commingling of tastes makes the ominous buzzing in the pantry much more to be dreaded than the high-keyed note of the mosquito in the sleeping room above.

This summer we captured a fly on South Street which upon examination was found to be carrying in his mouth and on his legs over one hundred thousand (100,000) fecal bacteria. He had been walking over human excreta on the water front and was on his way to the nearest milk pitcher.

There is crying need for better sanitation on our dairy farms. There is also the same need for it right in our own city. Our entire water front is without decent sanitary toilets and most of the wharves are without any at all. The sewer conditions are intolerable.

It is to be hoped that the gross defects which we have pointed out in general sanitation as well as in sewage disposal will be remedied before the summer of 1908. We have estimated that proper sanitation along the lines pointed out will reduce the typhoid deaths in New York from 650 to 360 a year and the diarrhœal deaths from 7,000 to 2,000 a year. This latter figure provides that germ-infected flies are not permitted to contaminate the milk supply either before it reaches the city or after. This saving of over 5,000 lives a year will also be accompanied by the additional saving of some 50,000 cases of sickness.

Respectfully submitted,

DANIEL D. JACKSON.

LETTER TO GOVERNOR HUGHES

NEW YORK, December 16th, 1907.

Hon. Charles E. Hughes, Governor,

State of New York, Albany, N. Y.

SIR:—

PERMIT me to refer to my communication of August 13th, 1907, and to call your attention to the continued violation, by the City of New York, of Chapter 468 of the Health Laws of this state. In that letter it was pointed out that the City of New York was subject to a fine of $44,186,735 for violation of said health law from 1903 to September 1st, 1907.

While I appreciate the extraordinary burden of work which encumbers the executive office and the perplexities which beset the routine of the Attorney General's department, still may it not be in order, if not urgent—in view of future healthful conditions of this locality—to institute immediate measures, through executive intervention, to prevent present and future violations of the law; *also to check the growth of the fine* which is accumulating against the City of New York at the rate of $31,200 daily, amounting since September 1st to $3,151,200. This amount, together with the $44,186,735 incurred prior to September 1st, is $47,337,935, and this latter amount is now due as a penalty from the City of New York, according to Chapter 468, Laws of 1903.

Evidence of the violation of the law and the consequent menace to the public health has been brought to the notice of the public officials on whom devolve the enforcement of the law. I am informed by Dr. Eugene H. Porter, State Commissioner of Health, that no permits have been issued by the Health Department at Albany for new or old sewers in New York City, nor have any papers been filed in the various County Clerks' offices in accordance with the provisions of said Chapter 468, Laws of 1903.

The pollution of the harbor continues and unhealthy conditions, especially during the past summer, have been and are now intolerable.

Some engineers still hold to the theory that the pollution of the waters of New York Bay, the North and East Rivers and the waters adjacent thereto by sewage, manufacturing wastes and general filth and refuse is not complete and has not yet become a nuisance or even reached an unsanitary stage.

The public mind has been fostered and led to believe that so large a body of pure salt water as the Atlantic Ocean, by its proximity to New York, provides a purifying influence through the agency of the ebb and flow of the tidal currents. Recent investigation by the Metropolitan Sewerage Commission indicates conclusively, that the pollution is not carried to sea but is deposited in the bed of the bay and rivers, the swift current forcing the suspended matter to eddy into the docks and slips, there to be deposited or to float on the surface in masses. This affords breeding ground for flies—the common house fly—which we believe and hereinafter will endeavor to show are, in this locality, the chief disseminators of typhoid fever and other intestinal diseases, the germs of which they gather from the fecal matter and filth discharged from the sewers.

Under the direction of Dr. Daniel D. Jackson of the Pollution Committee of the Mer-

chants' Association, fly traps were placed this summer on piers; under the piers; one block from the river and so on around the water front in the various boroughs. Assigned to districts, inspectors were detailed to gather the captive flies, which were taken to the laboratory and daily counts made of their numbers and the material on the body, mouth and legs of the insects examined.

The form and character of the fly's body is particularly adapted for carrying the infectious material, and as they breed in fecal matter almost exclusively and at the rate of thousands for each individual fly, the consequent facility for the spread of disease-breeding germs is apparent.

To prove by experiment, captured flies were thoroughly cleaned and then allowed to walk over infected material. They were again examined and the material which they carried analyzed. In one instance, a fly captured on South Street this summer was found to be carrying in his mouth and on his legs over one hundred thousand (100,000) fecal bacteria, showing the affinity to dangerous germs for this active medium of dissemination.

There were 5,247 cases of typhoid fever and of other intestinal diseases in the City of New York from July 1st to October 31st, this year. Our investigation shows that as the temperature rises the flies become more active and intestinal diseases become generally prevalent, with a corresponding increase in mortality. An erroneous impression inclines to the belief that the disease is due to hot weather. While climatic conditions, by reducing the vitality, favor the contraction of the disease, they are not usually the real cause of it. The temperature does not produce the specific germ which invariably accompanies the malady. The activity of the house fly is in proportion to the temperature, and the time at which it is most active and most numerous corresponds exactly with the time of the contracting of typhoid and other intestinal diseases.

Reference to the accompanying chart will show by returns from the fly traps in one representative district, from July 1st to September 1st, that the highest temperature occurred simultaneously with the greatest number of flies caught and the greatest number of deaths from intestinal diseases. The accompanying maps will show said intestinal diseases to be prevalent in a certain belt extending around and near the water front, a district in which the inhabitants are densely massed and made up of the poorer people. At points where sewer outlets are infrequent, notwithstanding the maximum of population, the plotted chart will show much less mortality as compared with other districts where the sewers are numerous. In many or most parts of the city, especially at a distance from the water front, or at points where no fecal matter was exposed, very few flies were found. Our map indicates an apparent exception to this rule of infection by flies due to the polluted conditions on the water front. The locality referred to is near the Bowery, remote from the water front. Upon investigation, however, open and filthy toilets (hopper variety) were found clogged, with flies swarming on the same substance which attracts them to the sewer outfalls on the water front. Thence they were flying, germ-laden, to the neighboring tenements to taint the food and spread disease.

Much is said about the scattering of disease germs by mosquitoes, but they are not to be compared with flies as disseminators of disease. Deaths from malaria (the mosquito's specialty) reported for 1905 in New York City were only fifty-two (52).

The pollution of the river (through the medium of flies) is a grave danger to food stuff. Most of the fish markets are near or over the sewage-laden waters of the rivers.

Meat, fruit and vegetables are all exposed to the same peril. Flies travel from filth to food and are carried to the kitchen and dining room through various delivery methods.

On ferry boats, on recreation piers, on bulkheads and docks mothers can be seen during the summer with flies crawling over the mouth, nostrils and eyes of infants on their laps, trailing the poison from the deposits of nearby sewers.

The public bath house records show that in 1905 five million bathers availed themselves of the privilege of a sewer bath; tens of thousands of boys and young men were to be seen swimming from boats, piers and shores, swallowing the filth, absorbing the infection and conveying it home to the other members of the family.

The few fish that are caught are impregnated with the odor of the sewer and their condition is on a par with the poisoned oyster of New York Bay. In fact, many fish caught elsewhere are kept alive in fish-cars immersed in the sewage-diluted water of the river.

Marine Insurance Companies are loath to insure a vessel destined to load in Newtown or Gowanus Creek. The galvanic action set up by the acids and manufacturing wastes destroys the copper sheathing on the hulls. Condenser pipes and metal valves of steamers are ruined by the same corroding influence.

Ship owners and sea captains prefer to load in other ports rather than to jeopardize the health of their families and crews by the foul gases arising from polluted waters in certain parts of the harbor.

Along South Brooklyn shore, Gravesend Bay, Rockaway and the Bronx come many complaints of intolerable sanitary conditions. In very many places the sewers do not empty below the water line. Many are broken and the contents flow out on the low lands, producing an insufferable nuisance.

I forego furnishing further details, the same being amply set forth in the accompanying report.

In view, therefore, of continued violation of this important law, and in view of growing indifference for the public health, I respectfully petition your Excellency to make an immediate investigation, to the end that the law be enforced and conditions remedied before the season of 1908 begins.

Respectfully,

EDWARD HATCH, JR., *Chairman*.

THE MERCHANTS' ASSOCIATIONS' COMMITTEE ON POLLUTION OF THE WATERS OF NEW YORK.

EDWARD HATCH, JR., *Chairman.*
J. PIERPONT MORGAN.
JOHN Y. CULYER, C. E.
ALBERT VANDER VEER, M. D.
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